OUTPUT PENTODE

EL91

Output pentode rated for 4W anode dissipation suitable for use as an r.f. or a.f. amplifier.

HEATER

V_h	6.3	V
I_h	200	mA

CAPACITANCES

	Unshielded	*Shielded*	
c_{in}	3.7	3.8	pF
c_{out}	4.0	6.5	pF
c_{a-g1}	<300	<300	mpF

CHARACTERISTICS

Pentode connection

V_a	250	V
V_{g3}	0	V
V_{g2}	250	V
I_a	16	mA
I_{g2}	2.3	mA
V_{g1}	−13.5	V
g_m	2.5	mA/V
r_a	130	kΩ
μ_{g1-g2}	12	

Triode connection (g_2 connected to a)

V_a	250	V
I_a	18.3	mA
V_{g1}	−13.5	V
g_m	2.7	mA/V
r_a	4.3	kΩ
μ	12	

OPERATING CONDITIONS AS SINGLE VALVE AMPLIFIER

Pentode connection

V_{a-k}	250	V
$V_{g2(b)-k}$	250	V
R_{g2}	470	Ω
R_k	700	Ω
R_a	18	kΩ
$I_{a(o)}$	16	mA
$I_{g2(o)}$	2.3	mA
$V_{in(r.m.s.)}$ (P_{out} = 50mW)	820	mV
$V_{in(r.m.s.)}$	5.8	V
P_{out}	1.7	W
D_{tot}	10	%
$I_{g2(max.\ sig.)}$	6.3	mA

OPERATING CONDITIONS FOR 2 VALVES IN PUSH-PULL

Pentode connection

Cathode bias

V_{a-k}	250	V
V_{g2-k}	250	V
R_k (per valve)	820	Ω
R_{a-a}	15	kΩ
$I_{a(o)}$	2 × 14.5	mA
$I_{g2(o)}$	2 × 2.0	mA
$V_{in(g1-g1)r.m.s.}$ (P_{out} = 50mW)	1.8	V
$V_{in(g1-g1)r.m.s.}$	19.8	V
P_{out}	5.8	W
D_{tot}	2.5	%
$I_{a(max.\ sig.)}$	2 × 21.5	mA
$I_{g2(max.\ sig.)}$	2 × 5.0	mA

Fixed bias

V_{a-k}	250	V
V_{g2-k}	250	V
V_{g1}	−16	V
R_{a-a}	15	kΩ
$I_{a(o)}$	2 × 10	mA
$I_{g2(o)}$	2 × 1.4	mA
$V_{in(g1-g1)r.m.s.}$ (P_{out} = 50mW)	2.1	V
$V_{in(g1-g1)r.m.s.}$	21.5	V
P_{out}	5.6	W
D_{tot}	1.7	%
$I_{a(max.\ sig.)}$	2 × 19.5	mA
$I_{g2(max.\ sig.)}$	2 × 4.7	mA

P_{out} and D_{tot} are measured at fixed bias and therefore represent the power output available during the reproduction of speech and music. When a sustained sine wave is applied to the control grid, the bias across the cathode resistor will re-adjust itself as a result of the increased anode and screen-grid currents. This will result in approximately 10% reduction in power output.

OPERATING CONDITIONS AS R.F. AMPLIFIER

f	50	100	Mc/s
V_a	250	250	V
$V_{g2(b)}$	250	250	V
R_{g2}	33	33	kΩ
V_{g1}	−14	−14	V
R_{g1-k}	10	12	kΩ
R_k	470	470	Ω
I_a	16.6	16.8	mA
I_{g2}	2.9	2.8	mA
I_{g1}	500	400	µA
P_{load}	2.4	1.85	W
η_{load}	59	44	%

OPERATING CONDITIONS AS FREQUENCY DOUBLER

f_{out}	50	100	Mc/s
V_a	250	250	V
$V_{g2(b)}$	250	250	V
R_{g2}	33	33	kΩ
V_{g1}	−40	−40	V
R_{g1-k}	27	27	kΩ
R_k	470	470	Ω
I_a	16	16.3	mA
I_{g2}	2.8	2.6	mA
I_{g1}	1.2	1.1	mA
P_{load}	1.6	1.3	W
η_{load}	41	32	%

OPERATING CONDITIONS AS FREQUENCY TREBLER

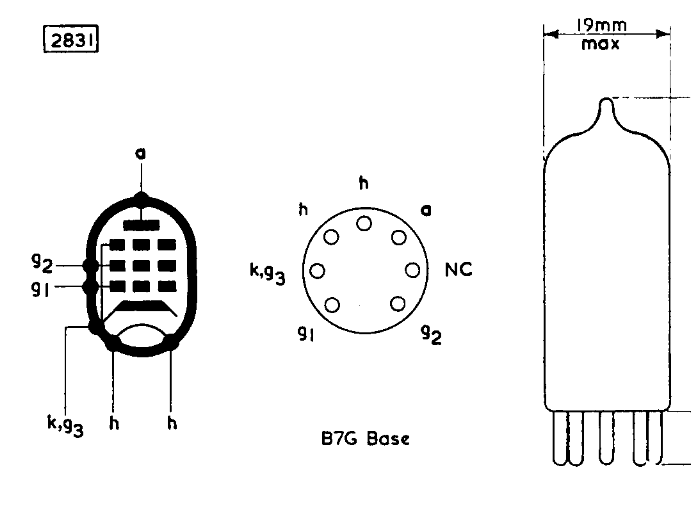
f_{out}	50	100	Mc/s
V_a	250	250	V
$V_{g2(b)}$	250	250	V
R_{g2}	33	39	kΩ
V_{g1}	−75	−75	V
R_{g1-k}	39	39	kΩ
R_k	470	470	Ω
I_a	15	16	mA
I_{g2}	2.6	2.3	mA
I_{g1}	1.7	1.7	mA
P_{load}	1.25	1.0	W
η_{load}	32	25	%

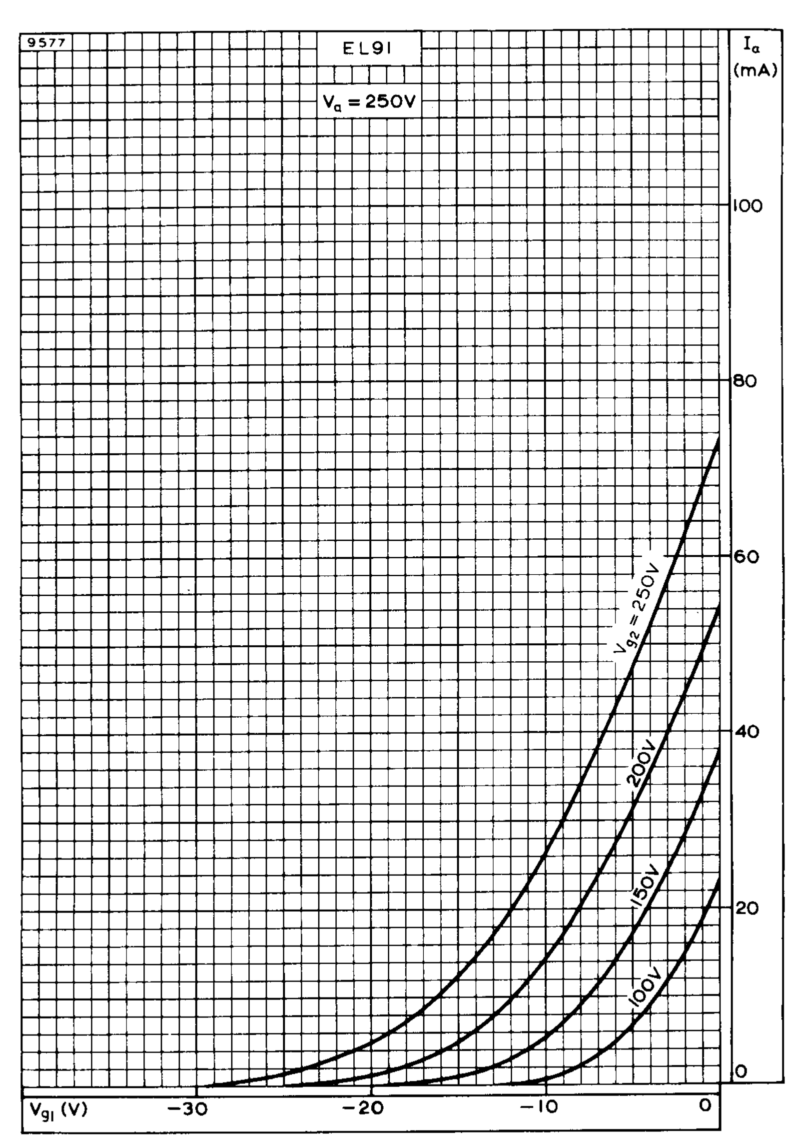
EL91

OUTPUT PENTODE

DESIGN CENTRE RATINGS

$V_{a(b)}$ max.	550	V
V_a max.	250	V
p_a max.	4.0	W
p_{a+g2} max.	4.5	W
$V_{g2(b)}$ max.	550	V
V_{g2} max.	250	V
p_{g2} max.	600	mW
$-V_{g1}$ max.	100	V
I_{g1} max.	3.0	mA
I_k max.	20	mA
R_{g1-k} max.	500	kΩ
V_{h-k} max.	150	V

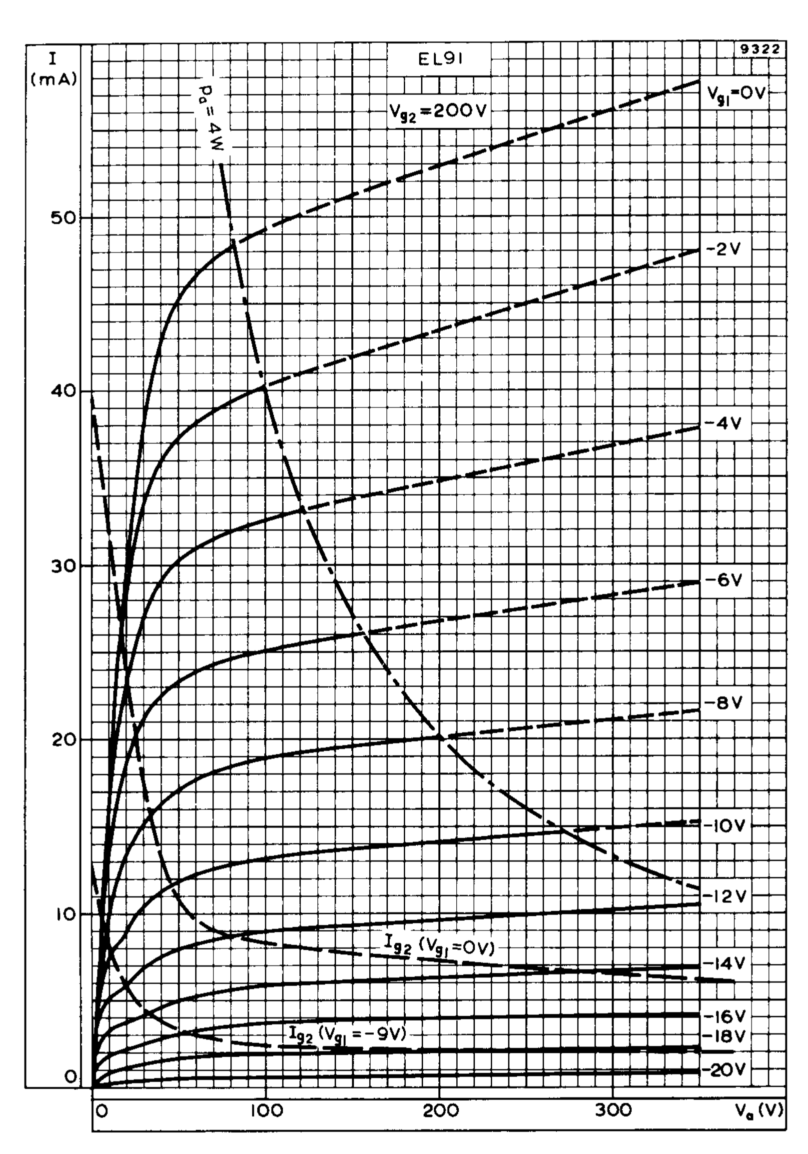




ANODE CURRENT PLOTTED AGAINST CONTROL-GRID VOLTAGE WITH SCREEN-GRID VOLTAGE AS PARAMETER

ANODE AND SCREEN-GRID CURRENTS PLOTTED AGAINST ANODE VOLTAGE WITH CONTROL-GRID VOLTAGE AS PARAMETER. $V_{g2} = 150V$





ANODE AND SCREEN-GRID CURRENTS PLOTTED AGAINST ANODE VOLTAGE WITH CONTROL-GRID VOLTAGE AS PARAMETER. $V_{g2} = 200V$

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OUTPUT PENTODE

ANODE AND SCREEN-GRID CURRENTS PLOTTED AGAINST ANODE VOLTAGE WITH CONTROL-GRID VOLTAGE AS PARAMETER. V_{g2} = 250V



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$V_a = V_{g2} = 150V$

r_a (kΩ): 0, 200, 400, 600, 800

g_m (mA/V): 0, 2, 4, 6, 8

I (mA): 0, 10, 20, 30, 40

V_{g1}(V): −30, −20, −10, 0

I_a, g_m, r_a, I_{g2}

9580

ANODE AND SCREEN-GRID CURRENTS, MUTUAL CONDUCTANCE AND ANODE IMPEDANCE PLOTTED AGAINST CONTROL-GRID VOLTAGE.
$V_a = V_{g2} = 150V$

ANODE AND SCREEN-GRID CURRENTS, MUTUAL CONDUCTANCE AND ANODE IMPEDANCE PLOTTED AGAINST CONTROL-GRID VOLTAGE.

$V_a = V_{g2} = 200V$

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$V_a = V_{g2} = 250V$

r_a (kΩ) | g_m (mA/V) | I (mA)

800 8 80

600 6 60

400 4 40

200 2 20

0 0 0

r_a I_a g_m I_{g2}

V_{g1}(V) −30 −20 −10 0

ANODE AND SCREEN-GRID CURRENTS, MUTUAL CONDUCTANCE AND ANODE IMPEDANCE PLOTTED AGAINST CONTROL-GRID VOLTAGE.
$V_a = V_{g2} = 250V$



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OUTPUT PENTODE

9578

EL91

Triode connected

I_a (mA)

80

60

40

20

0

$V_a = 250V$

200V

150V

100V

V_{g1} (V) −30 −20 −10 0

ANODE CURRENT PLOTTED AGAINST CONTROL-GRID VOLTAGE WITH ANODE VOLTAGE AS PARAMETER, WHEN TRIODE CONNECTED



ANODE CURRENT PLOTTED AGAINST ANODE VOLTAGE WITH CONTROL-GRID VOLTAGE AS PARAMETER, WHEN TRIODE CONNECTED